

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
JOSEPH WYTMAN)
Serial No.: Not Assigned) Group Art: 1763
Filed: Herewith) Examiner: MacArthur, S.
For: Compliant Wafer Chuck)
_____)

Assistant Commissioner of Patents
Box Amendment
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Dear Sir,

Before calculation of fees and examination of the above-referenced application,
please enter the following changes:

In the Written Description

Please amend the written description as follows:

Marked up copy of amendment to written description:

At page 2 line 2, on a line between "Compliant Wafer Chuck" and
"BACKGROUND OF THE INVENTION", please insert:

-- CROSS-REFERENCE TO RELATED APPLICATION

This application is a divisional of application serial number 09/293,012, filed April 16, 1999, and claims priority from that filing date. --

At page 4 line 20, please replace "difficult" with -- difficulty --.

At page 8 line 20, please replace "base" with -- wafer chuck --.

At page 8 line 21, please replace "base 10" with -- chuck base 11 --.

At page 8 line 22, please replace "base" with -- chuck base 11 --.

At page 10 line 3, please delete "18".

At page 10 lines 4, 6, 19, and 22, please replace "O-ring 18" with -- flexible coupling 16 --.

At page 11 line 13, please replace "groves" with -- grooves --.

At page 11 line 18, following "chuck 10", please insert -- of Figs. 1 and 2 --.

At page 12 line 2, please delete "18".

At page 17 line 7, please replace "O-ring 18" with -- flexible coupling 16 --.

Clean copy of amended paragraphs in written description:

The paragraph starting at page 4 line 20:

These problems are caused by the difficulty in properly sealing the containment sleeve on to the wafer's surface. The problem is amplified when larger diameter wafers are being processed, since the contact area is over a larger circumference. Since the

wafer is residing on a flat rigid surface of the chuck, the wafer is not flexible to adjust to any gap separation distance which exceeds the tolerance. Improper alignment of the wafer and/or the chuck can also cause a gap separation to widen.

The paragraph starting at page 8 line 16:

When the various components 11-16 are assembled together, they form a circular assembly which is substantially planar at both the top and bottom surfaces. The chuck base 11 is a rigid circular plate for forming the base (or lower portion) of the wafer chuck 10. The underside of the chuck base 11 is coupled to a shaft (also referred to as a spindle or mandrel), which supports the wafer chuck 10 in place. Openings or holes through the chuck base 11 allow fastening means (screws, bolts, etc.) to be used to mount the chuck base 11 onto the shaft. Openings are also present for passage of fluid, such as air or inert gas, or for providing vacuum. On the upper surface of the base 11 is an indentation 19, which is formed in the shape of the spider chuck 13. When assembled, the spider chuck 13 is made to reside within the indentation 19.

The paragraph starting at page 10 line 1:

Next, a flexible coupling 16, in a form of an elastomer, is placed along the outer periphery of the bottom disk 14. In the preferred embodiment, this elastomer is a rubber O-ring which fits tightly around the periphery of the disk 14. In the preferred design, a stepped groove is present for accepting the flexible coupling 16.

The paragraph starting at page 10 line 5:

Subsequently, the top disk 15 is positioned to mate to the lower disk 14. The position of the flexible coupling 16 is such that it also contacts the periphery of the upper disk 15. Corresponding openings are also present on the disk 15. Screws, bolts, etc. are used to mount both of the disks 14, 15 to the base 11. When so mounted, the base 11, disk 14 and disk 15 are rigidly fixed together so that they will not move separately when mounted to the shaft.

The paragraph starting at page 10 line 17:

It is appreciated that the chuck body 12 is not affixed to the other units. Rather, dowels 27 disposed along the underside of the chuck body 12, which are detailed in Figure 3, fit into corresponding openings 28 present on the base 11. The flexible coupling 16 provides a snug fit of the chuck body 12 to the two disks 14, 15. Thus, the chuck body 12 resides atop the base 11 without being affixed in a permanent fashion to the other units. A snug fit is provided by the flexible coupling 16, where the wall of the chuck body 12 at the central opening 17 mates to the sides of the two disks 14, 15. This placement of the chuck body 12 allows the body to tilt relative to the other units, but vertical alignment of the chuck body 12 to the base 11 is maintained by the dowels 27.

The paragraph starting at page 11 line 10:

In the preferred embodiment, multiple low pressure or vacuum openings 30 are present along the surface of the top disk 15 for applying vacuum to the underside of the

wafer to hold it in place (see Figure 1). Furthermore, grooves 31 emanate from the openings 30 and mate to a series of grooves 32 present on the surface of the chuck body 12, so that vacuum can be extended to the surface of the body also for holding the wafer in place. Accordingly, once the wafer is placed atop the chuck 10 and vacuum applied, the wafer is held in place, but the edges of the wafer are able to tilt relative to the fixed plane of the chuck determined by the two central disks 14, 15.

The paragraph starting at page 11 line 18:

A cross-section of the assembled wafer chuck 10 of Figs. 1 and 2 is shown in Figure 4. Figure 4 shows the complete assembly of the components described above with a wafer 35 positioned atop the chuck 10. As noted, the spider chuck 13 is in the normal or resting position at the bottom of the base 11. The chuck base 11 is affixed onto a shaft 36. The bottom and top disks 14, 15 are then affixed to the base 11. When the chuck body 12 is positioned in place and aligned properly, the dowels 27 fit into the openings 28 and lift pins 22 reside under openings 25. The flexible coupling 16, in the form of an O-ring, allows for a snug fit of the body 12 to the central disks 14, 15. However, since the chuck body is not affixed, the body 12 is allowed to move vertically and allowed to tilt relative to the chuck center.

The paragraph starting at page 17 line 5:

The components of the chuck 10 can be manufactured from a variety of materials. In the preferred embodiment, the chuck components, except for the lift pins 22 and the flexible coupling 16, are made from plastic materials. The sleeve is also made from

plastic. It is appreciated that metals, ceramic, quartz, etc. can also be used. The lift pins are metallic and the O-ring or elastomer is made from rubber. The materials selected should be compatible with the processing fluid being utilized.

In the Claims

Please cancel claims 1-16 without prejudice.

Please amend the claims as follows:

Marked-up copy of claims:

17. (Amended once) A method of processing a wafer comprising:
placing a wafer atop a wafer chuck, the chuck having a base and an upper body in which the upper body is coupled to the base by a flexible coupling that allows the upper [portion] body to tilt relative to the base;
engaging the wafer to a hollow sleeve which forms an enclosing vessel to retain a processing fluid therein, the wafer forming a floor of the vessel; and
processing the wafer utilizing the processing fluid, wherein [and in which] tilting of the wafer allows for a compliant engagement of the wafer and the sleeve [to adjust for gaps present at the engagement] to prevent or reduce leakage of the processing fluid.

18. (Not amended) The method of claim 17 further comprising the raising of at least one lift pin through the upper body to raise the wafer off of the upper body for removal of the wafer from the wafer chuck.

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19. (Amended once) The method of claim [18 further comprising the] 17 wherein processing [of] the wafer [in which] includes using the processing fluid [is used] to deposit copper material onto the wafer.

20. (Amended once) The method of claim [18 further comprising the] 17 wherein processing [of] the wafer [in which] includes using the processing fluid [is used] to remove copper material from the wafer.

Clean copy of claims:

17. (Amended once) A method of processing a wafer comprising:
placing a wafer atop a wafer chuck, the chuck having a base and an upper body in which the upper body is coupled to the base by a flexible coupling that allows the upper body to tilt relative to the base;

engaging the wafer to a hollow sleeve which forms an enclosing vessel to retain a processing fluid therein, the wafer forming a floor of the vessel; and

processing the wafer utilizing the processing fluid, wherein tilting of the wafer allows for a compliant engagement of the wafer and the sleeve to prevent or reduce leakage of the processing fluid.

18. The method of claim 17 further comprising the raising of at least one lift pin through the upper body to raise the wafer off of the upper body for removal of the wafer from the wafer chuck.

19. (Amended once) The method of claim 17 wherein processing the wafer includes using the processing fluid to deposit copper material onto the wafer.

20. (Amended once) The method of claim 17 wherein processing the wafer includes using the processing fluid to remove copper material from the wafer.

REMARKS

In the parent application, serial number 09/293,012, claims 17-20 were cancelled due to a restriction requirement by the examiner. Those claims are now being prosecuted in this divisional application.

The amendment to the written description duplicates those changes made in the parent application to correct minor errors in the text. The amendment to the claims corrects typographical errors, more clearly states the claimed elements by using clearer language, and broadens claim 17. No claim was narrowed by this amendment.

Claim 17 recites that a flexible coupling permits the wafer to tilt, and this tilting permits the wafer to engage the sleeve to form a floor of the vessel to prevent/reduce leaking of the processing fluid. This combination of limitations was not disclosed or

suggested by the references cited in the parent application. Claims 18-20 depend from claim 17 and therefore contain the same allowable elements as claim 17.


CONCLUSION

For the foregoing reasons, Applicant submits that claims 17-20 are now in condition for allowance, and indication of allowance by the Examiner is respectfully requested. If the Examiner has any questions concerning this application, he or she is requested to telephone the undersigned at the telephone number shown below as soon as possible. If this amount is incorrect, please charge any insufficiency or credit any overpayment to Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOLOKOFF, TAYLOR & ZAFMAN, LLP

Date: 4-4-01



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